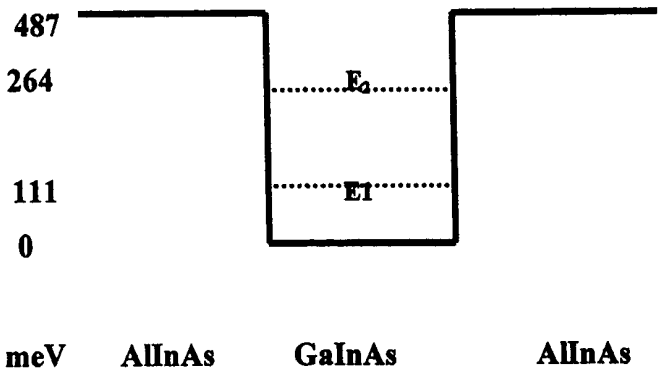


Figure 1a Prior Art

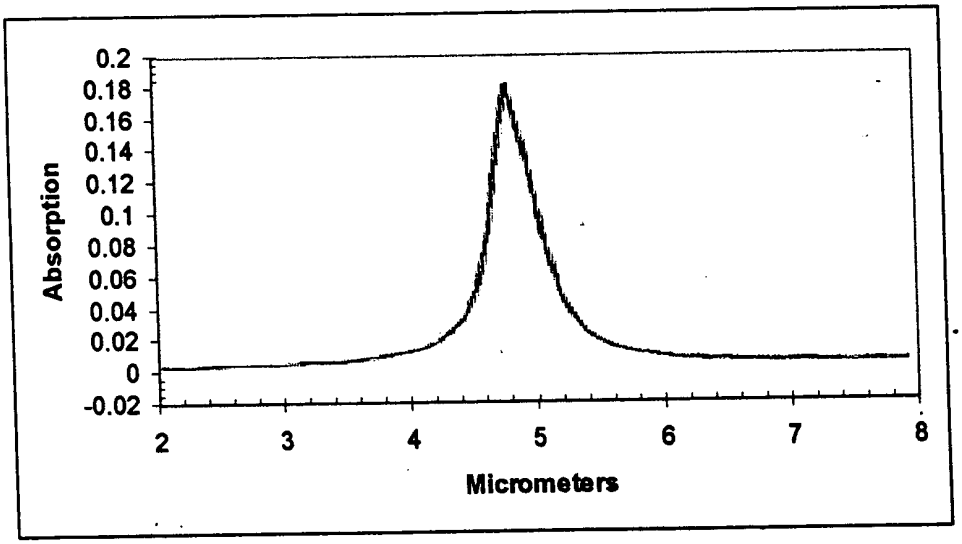


Fig 1b

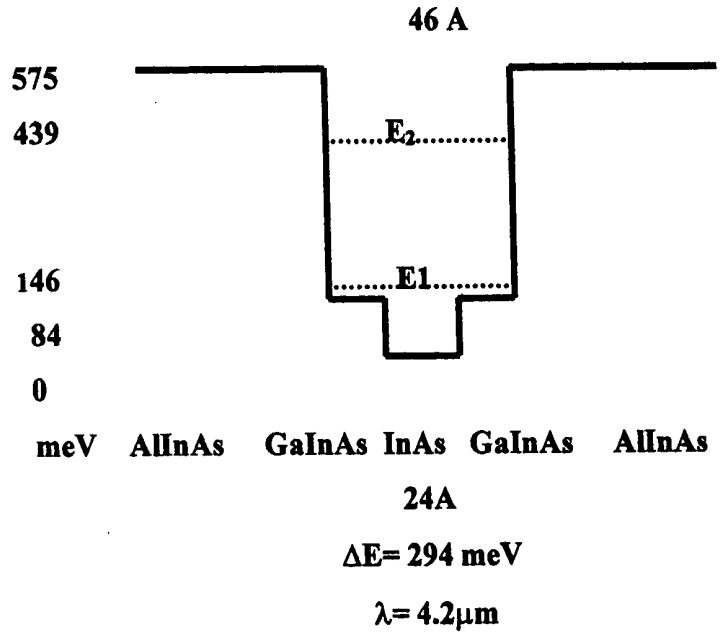


Figure 2a

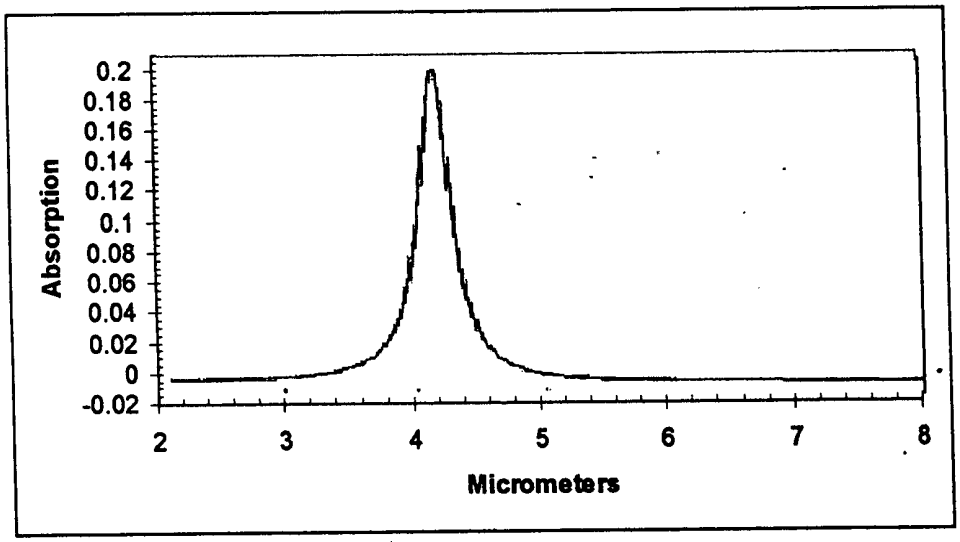


Fig. 2b

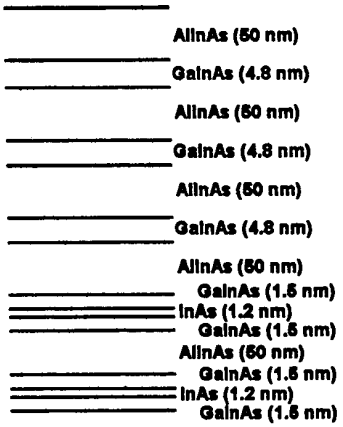


Figure 3a

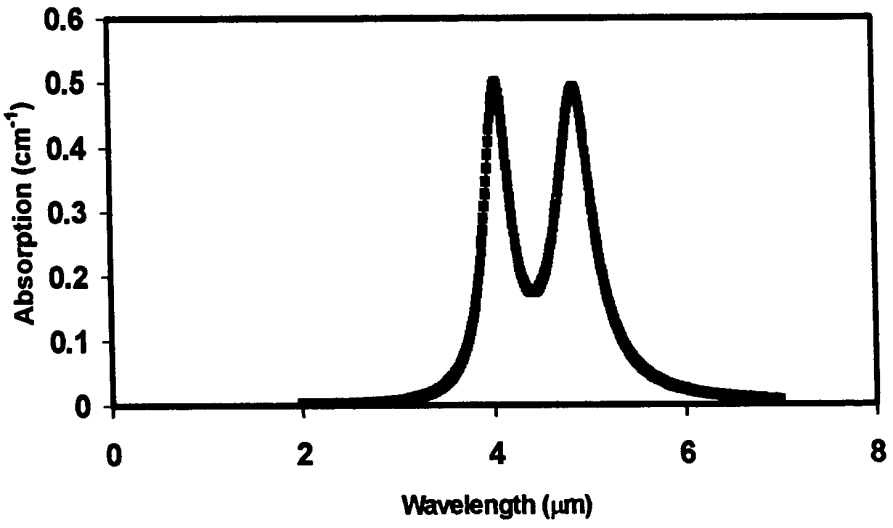


Figure 3b

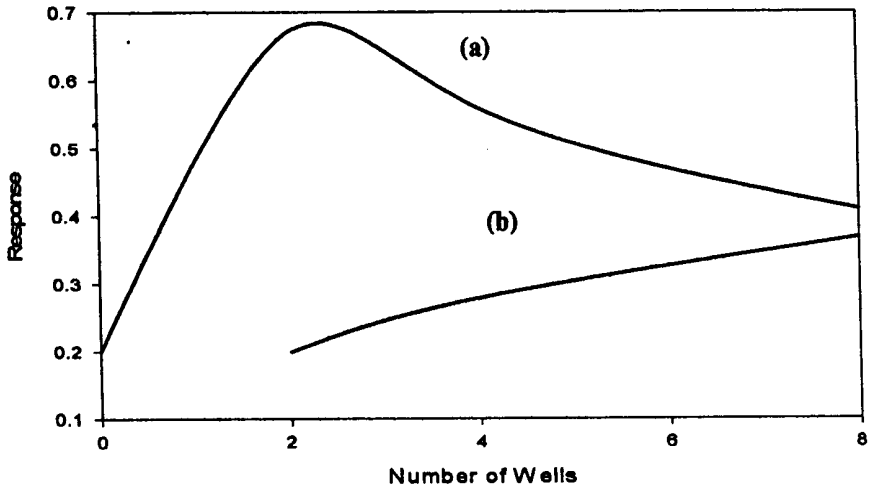


Figure 4

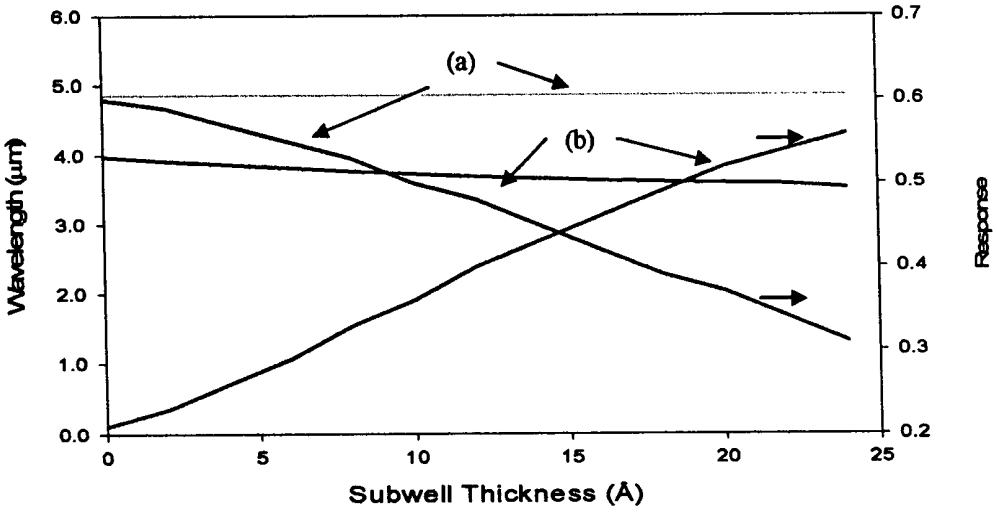


Figure 5

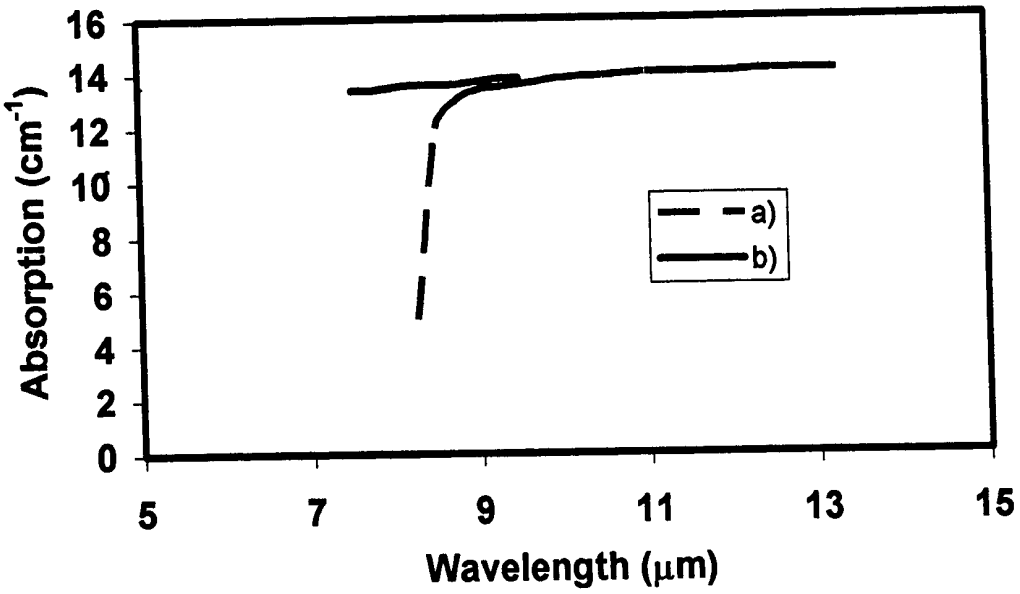


Figure 6

Layer #	Layer	Material	Thickness (μm)	Dopant	Repeat/ Wavelength
10	Emitter	GaAs	600	N+	
10	Barrier	AlGaAs	40		
9	Barrier/Well	AlGaAs/GaAs-InAs-GaAs	40/3.9-1.0-3.9		1
8	Barrier/Well	AlGaAs/GaAs	40/9.0		10/ 8 &12 μm
7	Barrier	AlGaAs	40		
6	Collector	GaAs	1000	N+	
1	Buffer	AlGaAs	150		
	GaAs-Substrate				

Figure 7a

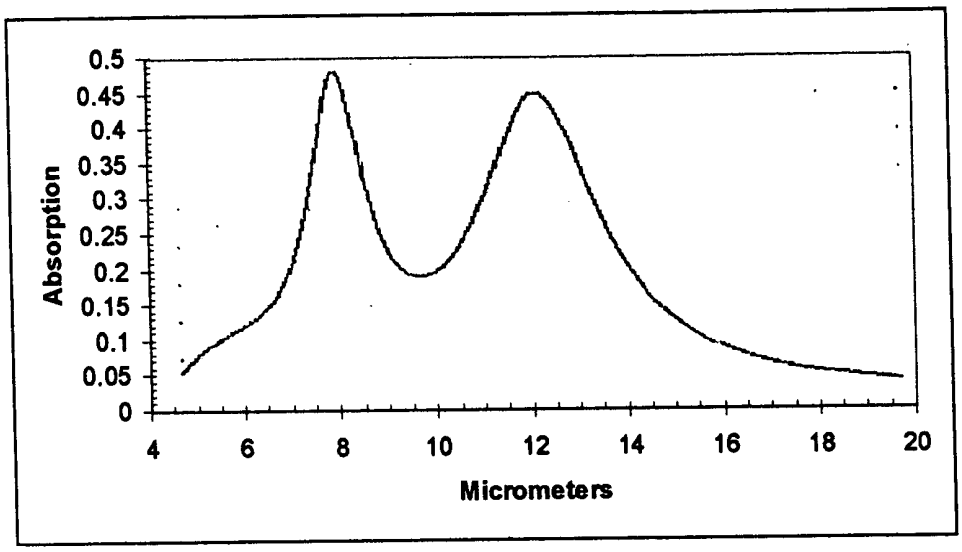


Figure 7b

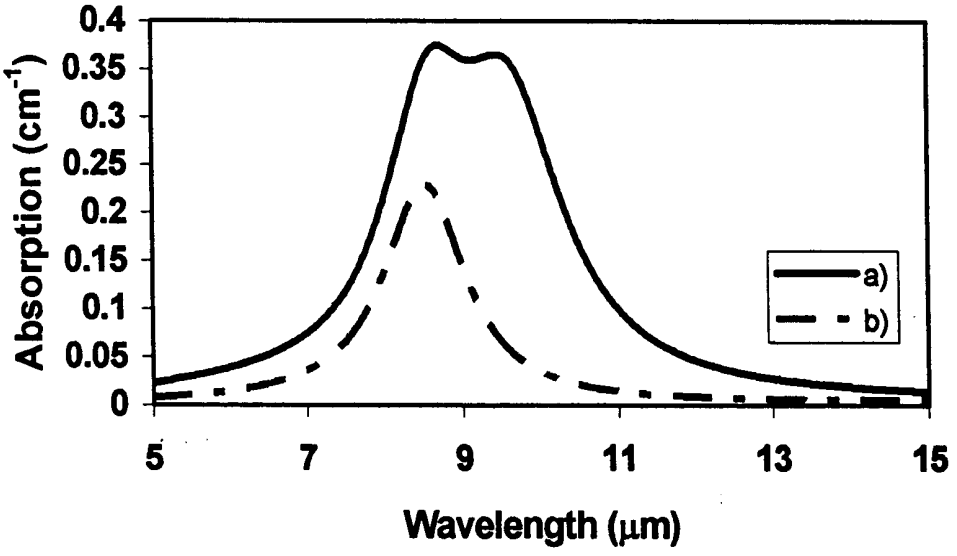


Figure 8

Layer #	Layer	Material	Thickness (nm)	Dopant	Repeat/ Wavelength
12	Emitter	GaInAs	1000	N	
11	Barrier	AlGaInAs	200		
10	Well/Barrier	GaInAs/AlGaInAs	8.2/10		3
9	Barrier	AlGaInAs	40		
8	Well/Sub-well/Well	GaInAs/InAs/GaInAs	2.1/1.5/2.1		2
7	Barrier	AlGaInAs	40		
6	Well/Barrier	GaInAs/AlGaInAs	8.2/10		3
5	Barrier	AlGaInAs	40		
4	Well/Sub-well/Well	GaInAs/InAs/GaInAs	2.1/1.5/2.1		2
3	Barrier	AlGaInAs	200		
2	Collector	GaInAs	1000	N	
1	Buffer	AlInAs	150		
	InP-Substrate				

Figure 9a

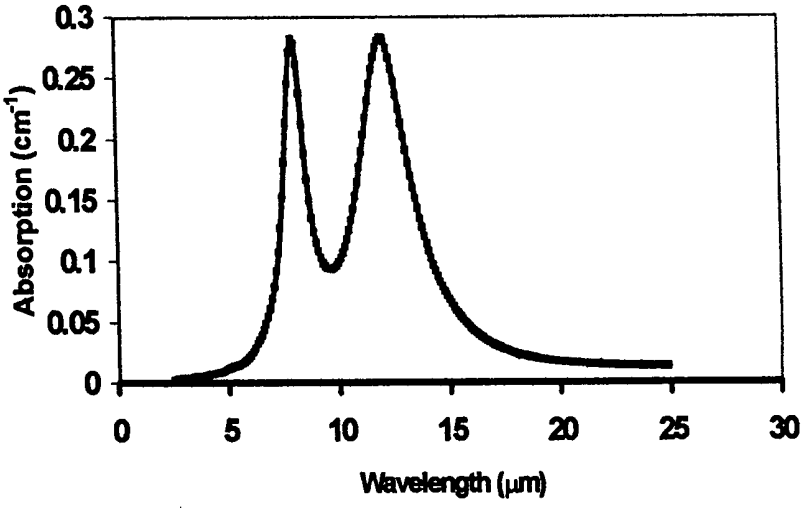


Figure 9b

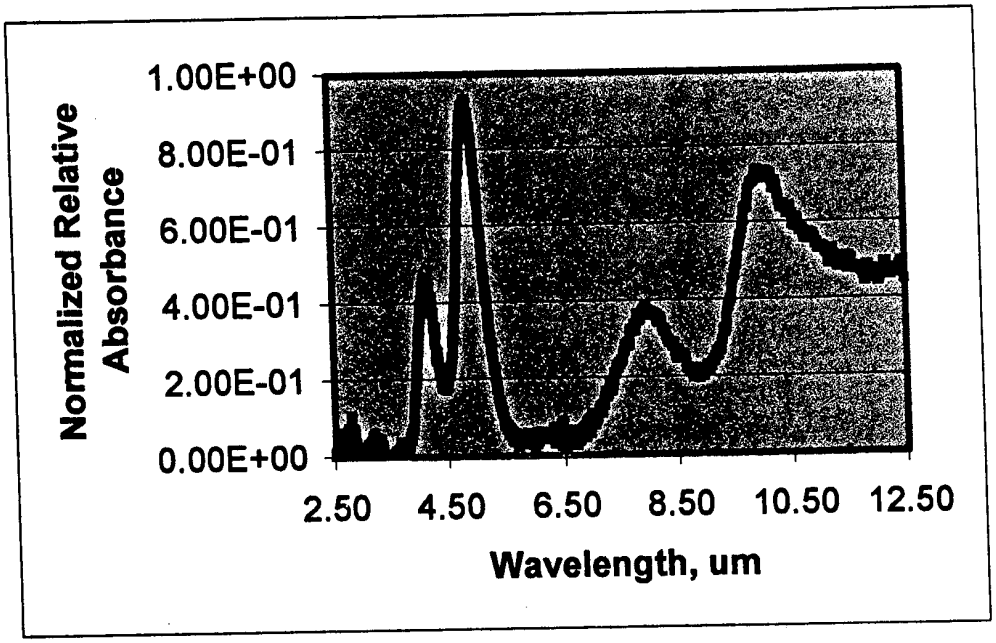
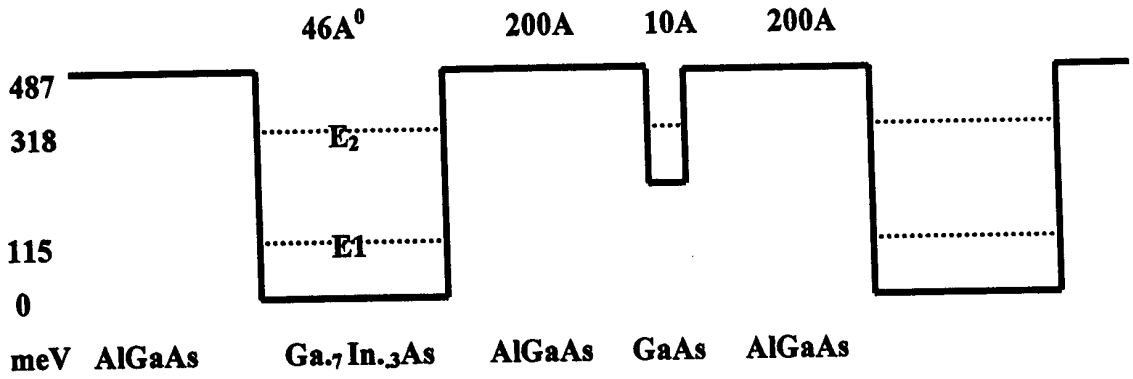


Figure 10



$\Delta E = 264$ meV

$\lambda = 4.7\mu m$

Figure 11a

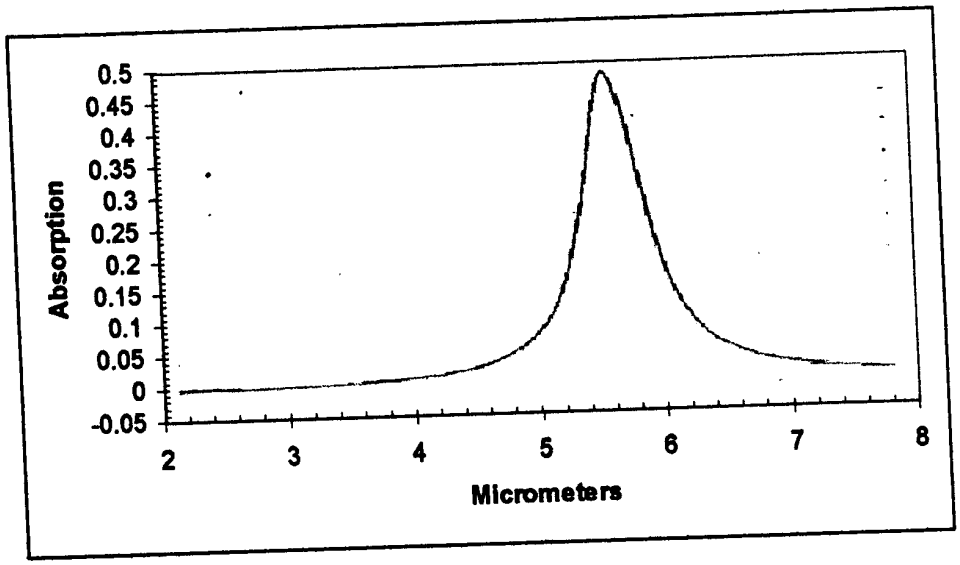


Figure 11b

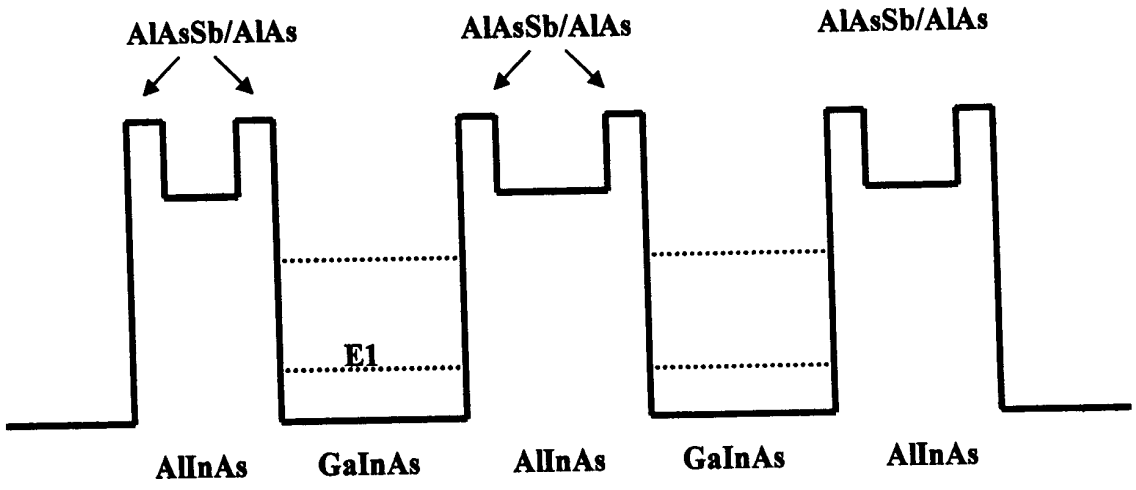


Figure 12